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Description

The present invention relates to a modular knee prosthesis.

In the reconstruction of the anatomical knee joint by total replacement with a prosthetic joint, the femoral, tibial and patellar prosthetic components provide a total knee joint prosthesis in which the contacting surfaces of the components operate to provide a functioning knee joint. At the present time, most total knee prostheses provide for antero-posterior rotation in order to simulate movement similar to the anatomical knee joint with the tendons and ligaments of the joint imparting stability with the component affording a certain degree of stability in the medio-lateral movement. A very common type of knee joint presently utilized is disclosed in US-A-4298992, issued on November 10 1981, for a "Posteriorly Stabilized Total Knee Joint Prosthesis" wherein there is included a femoral component utilizing a pair of laterally spaced apart condylar portions, each of which having an external surface convexly curved to match generally the lateral profile of the anatomical femoral condyle. US-A-4298992 further discloses a tibial component and a platform portion including spaced apart concavities for receiving each of the condylar portions of the femoral component. The post extends from the tibial plateau into the intracondylar recess of the femoral component so that upon full flexion of the joint, the knee joint is stabilized between the tibial post and femoral recess. US-A-4298992 addresses the prevention of translocation of the knee during flexion.

During the surgical replacement of a total knee, the surgeon must conduct precise angulated cuts into the femoral condyles of the femur so as to position the femoral component snugly in place so that the joint operates smoothly and is able to undertake the various movements of an anatomical knee. In order to accommodate the femoral component precisely in place, the surgeon is confronted with the problem of having to cut away or "shave" bone that has been worn down or- is in a weakened condition unknown to the surgeon until inspection of the bone during the course of the surgery. In order to properly mount the femoral component onto the femur, the weakened or worn portion of the bone must be removed, so that this component can be properly secured to solid bone. The result is that the surgeon may consequently, have to achieve a total knee replacement without having a means to replace greater bone loss than was originally foreseen, resulting in the undesirable condition that the particular leg is slightly shortened by the excessive cutting away of bone and that the location of the prosthetic knee is not precisely in line with the original anatomical knee.

EP-A-0069683 discloses a knee joint prosthesis having a tibial component, comprising a platform portion, and a femoral component, comprising a pair of condylar portions, each of the condylar portions including an external surface for registering with the tibial component to allow travelling movement of the components in relation to one another for simulating the movement of a natural knee. The prosthesis of EP-A-0069683 does not however possess means for adjusting the position of the femoral component relative to the femur (and hence the position of the prosthetic knee) to compensate for, for example, excess bone removal from the femur during preparation of the femur by the surgeon.

According to the present invention there is provided a modular knee prosthesis, comprising: (a) a tibial component, comprising a platform portion; and (b) a femoral component, comprising a pair of condylar portions, each of the condylar portions including an external surface for registering with the tibial component to allow travelling movement of the components in relation to one another for simulating the movement of a natural knee; characterized in that the platform portion has a pair of oblong concavities, that the external surface of each of the condylar portions is arranged to register with a respective concavity and that the prosthesis further comprises: (c) platform means adapted for mounting on the femoral component and, in use, to register with the lower end of the femur, said platform means comprising at least one of a plurality of interchangeable means of different thicknesses selectable to adjust thickness the of the platform means.

The thickness of the platform means is adjustable by selecting appropriately sized interchangeable means from a plurality of interchangeable means of different thicknesses to set correctly the spacing between the femoral component and the cut end of the femur.

For a further understanding of the nature of the present invention, reference should be had to the following detailed description, taken in conjunction with the accompanying drawings, in which like parts are given like reference numerals; and wherein:

Figure 1 is an overall exploded view of the preferred embodiment of the apparatus of the present invention;

Figures 2 and 3 are plane and side elevational views of the modular plate members of the present invention;

Figures 4 through 6 are perspective views of alternate embodiments of the platform portion of the apparatus of the present invention;

Figures 7 and 8 are side elevational and top views respectively of a femoral component of the present invention; and

FIGURES 9 and 10 are side cross-sectional views in generally schematic form showing the assembled components between full extension to substantially full flexion in the preferred embodiment of the apparatus of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the modular knee joint prosthesis is illustrated in the Figures by the numeral 10. Knee joint prosthesis 10 includes a primary femoral component 12 a modular component cooperating with a tibial component 13. The femoral component 12 is a generally U-shaped member as seen in a side view (FIGURE 7); and comprises a pair of laterally spaced apart femoral condylar portions 14 and 16, each of which is smoothly convexly curved in lateral profile generally to match the curvature of the anatomical femoral condyle that is being replaced. Each condylar portion 14 and 16 is laterally convexly curved entirely along their antero-posterior extent. As seen in profile view in FIGURE 7, each condyle 14 or 16 includes a posterior portion 18 which merges smoothly with the lower curved surface 20. Surface 20 is designed to register with the tibial base portion, which in turn merges smoothly with the convexly curved forward or anterior portion 22, the medial part of which is laterally concave to receive patella portion 24. The spaced apart femoral condylar portions 14 and 16 define a traveling space 26 therebetween for accommodating, during flexion, the movement of the tibial post, as well be described further. Further, the femoral component 12 is constructed along its interior surface so as to receive femoral platform 40 therewithin.

The component 12 includes a first pair of anterior faces 28, each respectively on the pair of femoral condylar components 14 and 16, leading to anterior angulated faces 30 and the lower base face 32 on each condylar component. The anterior portion 22 of femoral component 12 includes angulated face portion 34 joined to the base faces 32 and to an upper substantially vertical face 36, the various faces in the femoral component 12 defining an area for receiving the femoral platform 40 therewithin.

The tibial component 13 as seen in the FIGURES, would comprise a tibial base portion 15 for accommodating and affixing a tibial platform 17 thereupon. Tibial base portion 15 would include a floor portion 18 generally configured to resemble the overall configuration of the upper end portion of the tibia which is prepared to receive base portion 15 thereupon. Base portion 15 would include lateral and medial hemispheres 19 and 21 respectively, and include a flat superior surface 22 for receiving tibial platform 17 in engagement therewith. Further, base portion 15 would include a stabilizing post 23 extending from its inferior surface 25 of floor portion 18, with stabilizing post 23 insertable into the tibial medullary canal and would provide for the stabilization of the component on the tibia. As seen further in the Figures, the preferred embodiment of the tibial component 13 would include a base portion 15, which would include a posterior raised wall 27 extending from substantially the medial outer wall to the lateral outer wall across the posterior edge of floor portion 18, to serve as a means for engaging the posterior edge 27 of the tibial platform when the platform 17 is placed onto the base portion 15. Further, there is included a pair of anteriorally positioned raised walls 29 and 31 on the anterior edge 33 of base 15, so that edge 29 and 31 of platform 17 would be engaged against the wall 27, and platform 17 secured in place between posterior wall 27 and anterior walls 29 and 31 and held rigidly in place. For purposes of construction, tibial component 13 could be a single piece component, and not include the separate platform 17 apart from the base portion 15.

Turning now to platform 17, platform 17 is shaped generally in the configuration of base portion 15, likewise having lateral and medial hemispheres 35 and 37 respectively, with hemispheres 35 and 37 each including a substantially oblong cavity 39 and 41 respectively, each of which would receive one of the femoral condylar portions 14 and 16 to be nested into the oblong cavities 39 and 41 so that anterior-posterior translation, lateral angulation and rotation are achieved, all of which would be involved in the normal articulation of the antomical knee joint.

As seen in the Figures, there is also included a central located stabilizer post 43 positioned on the superior face of tibial platform 17, the function of which will be described further. In the preferred embodiment, the radius of the posterior curvature of the component is slightly less than the radius of the lateral curvature of the femoral condylar portion so as to allow rotation therewithin.

Turning now to the modular component of the joint 12 as shown in FIGURE 1, the femoral modular platform 40 includes a base portion 45 joined to a pair of spaced apart platform portions 46 and 48 to register with the inner faces 32 of the femoral condylar components 14 and 16. There is further provided an angulated member having anterior face 50 which would register against inner angled surface 34 of femoral component 12 as platform 40 is lowered onto femoral component 12. Each of the base portions 46 and 48 include a bore 52 for receiving therethrough pin members 54 and 56 which are mounted on condylar portions 14 and 16 and extend upwardly from surfaces 32. The pin members 54 and 56 are aligned with bores 52 to enable platform 40 to be secured therethrough via the use of mounting nuts 58 which threadably engage threads 59 of pin members 54 and 56. The mounting shaft 80 is attached to angled member 50 for mounting into the femur. As seen particularly in side view in FIGURE 7, with the positioning of platform 40 onto femoral component 12, platform 40 provides a means for achieving a greater thickness to femoral component 12 to compensate for any excess loss of bone during the surgical procedure of implanting the component onto the anatomical femoral con-

dyle. It should be noted also in FIGURE 7 that the undersurface of platform 40 mates precisely with the angular configuration of the various inner surfaces 30, 32, and 34 of the femoral component to achieve a snug fit therebetween. However, for purposes of construction a cement which is standard in the industry could be utilized intermediate the platform 40 and femoral component 12 so as to further achieve a permanent fixture therebetween.

The modular platform 40 of the knee prosthesis 10 also includes additional modular components for achieving a construction of the femoral portion to meet unforeseen loss of bone during the course of surgery as described earlier. Turning now to FIGURES 1, 2 and 3, one type of modular component would include rectangular plates 70 which are positionable as seen in FIGURES 1 and 7 on the face portions 46 and 48 of platform 40. The plates 70 include a bore 73 for allowing pin members 56 and 54 to be secured therethrough as seen in the FIGURES. Therefore, in addition to the thickness of the initial platform 40 to compensate for bone loss, additional plates such as plate 70 may be affixed to the upper surfaces 46 and 48 of component 40 to provide a further height to the femoral component as indicated in phantom view in FIGURE 7. It should be noted that in the construction of plate 70, plate 70 includes angulated front and rear faces 74 and 75 respectively, which register precisely with the sloped faces 34 and 50, respectively of femoral component 12 so as to achieve a firm and snug fit therebetween. The bottom of each adjustment plate 70 includes a rectangular raised area 70A for seating on surfaces 32. Again, for purposes of construction, cement may be positioned intermediate the components for achieving a more permanent fit therebetween.

As seen in FIGURE 7, an additional plate 71 of similar construction to plate 70, may be positioned along the inner surface 50 of platform 40, so as to achieve a thickening of that particular area of the femoral component 12. Another plate 72 set along face 28 of component 12 cooperates with plates 70 and 71 again to compensate for loss of bone along that particular face as seen in FIGURE 7. It is foreseen that the various types of plate members 70, 71, 72 utilized in this modular configuration, could be utilized along any inner face, i.e., any of the internal surfaces 28, 30, 32, and 34 enumerated in femoral base component 12, so as to provide means for allowing the replacement of loss of bone through a build-up of the condylar portion itself. Plate members 71 and 72, which are generally rectangular plates sized to fit against surfaces 34, 30, and 28 are similar to plate 70 except that no opening 73 or bottom insert portion 70A are needed, and would be secured to femoral platform 40 utilizing bone cement common in the art.

In addition, as seen in FIGURE 1, platform 40 includes a fixation post of shaft member 80 which extends superiorly into the space within the femoral bone so as to further secure the entire femoral portion 12 to the femur. Fixation post 80 may be permanently positioned onto platform 40 as seen in FIGURE 1, or platform 40 may be without a post 80, with the pair of mounting posts 50 and 52 providing the means for securing femoral portion 12 upon the femur, again with the assistance of cement. Various alternate embodiments of platform 40 will be discussed in detail further.

Returning to the construction of platform 40, there is further included a means for providing stability to the knee as the knee is flexed and a means to prevent lateral movement of the knee beyond a certain point which may result in dislocation of the joint. This means would include first and second triangulated vertical walls 60 and 62 which mount superiorly from the inner edge of the face portions 42 and 44, the walls 60 and 62 including a transverse stabilizing bar 64 interconnecting walls 60 and 62. The walls 60 and 62 are joined together by a ramp or wall 65 which extends from the highest point at transverse post member 64 at approximately a 45° angle to the base portion 45 of platform 40. The vertical walls 60 and 62 and angled wall 65 define a traveling space 61 therebetween for allowing travel of the tibial post 43 within space 61 during articulation of the knee, as will be described further.

Addressing an additional aspect of the present invention, reference is made to FIGURES 8 and 9 of the drawings. As just described, platform 40 includes the traveling, intercondylar space 61 defined by parallel triangulated wall portions 60 and 62 with horizontal stabilizing bar 64 spanning therebetween and angled top wall 65. As seen in the Figures, traveling space 61 serves as a means to provide tibial post 43 of tibial member 13 with a confined traveling space intermediate femoral condyles 14 and 16 when femoral condyles 14 and 16 are registered in recesses 39 and 41 to complete the construction of knee joint 10. Therefore, as seen in FIGURE 9, femoral portion 12 is resting in tibia portion 13, when the knee is in full extension, such as a standing position, with the post 43 positioned intermediate triangulated walls 60 and 62 within space 61. As the knee is rotated in the direction of Arrow 95A, such as by raising the foot to the rear of the knee, the natural rotation of knee 10 would provide that femoral portion slide slightly forward in recesses 39 and 41. In order to prevent lateral movement to occur to the point where femoral portion would be disengaged from recesses 39 and 41 as seen in the direction of Arrow 96, transverse post member 64 would move from the position from its highest position as seen in FIGURE 9 to a position where the lower face 67 of transverse bar 64 serves as a camming or limiting surface against the rear face 91 of tibial post 43. Upon transverse post 64 camming against face 91, femoral portion 12 is prevented from

moving further forwardly than the position as seen in FIGURE 10 although further rotation of the knee in the direction of Arrow 95A may occur. Therefore, transverse post 64 in cooperation with tibial post 90 serves to stabilize the knee as it is rotated to full flexion, i.e., from a 0° angle in FIGURE 8 to substantially equal to or greater than 45+° angle during full flexion.

Lateral confinement of the knee is also provided by the cooperation of tibial ramp post 43 and the corresponding triangular or ramp recess formed by modular component walls 60 and 62. During rotation in a vertical place, the post 43 rotates between extended portions rather freely. However, any undesirable or lateral or rotational movement of the knee is prevented by the enter-engagement of wall 91 of post 43 against triangular walls 60 and 62 forming travel recess 61 on the modular component 40.

FIGURES 4 through 6 represent additional embodiments of platform portion 40, as is illustrated in FIGURE 1 in the preferred embodiment. As seen in FIGURE 4, platform portion 40, in this particular embodiment, would likewise include the lower base portion 45, the angulated base portion 50, and the centrally located traveling space 61 formed by triangular walls 60 and 62 and transverse connecting bar 64. Unlike the preferred embodiment, this particular embodiment would not include the post member 80 insertable into the femoral bone. In this particular embodiment, it is foreseen that the base 40 would be secured in position into femoral bone via the pair of mounting nuts 54 and 56 which would protrude through bores 52 and would be secured onto femoral components 12 via nuts 58. It is foreseen that this particular embodiment would be used in a replacement knee which would not require the use of a central post 80 for purposes of function.

In FIGURE 5, again there is illustrated platform 40 likewise including a base 45, angulated base portion 50, and in this embodiment, post member 80. Further, as illustrated, the platform 40 also contains rectangular recesses 101 and 103 respectively, for accommodating the rectangular inserts 70 as illustrated in FIGURES 2 and 3, for possibly building up the thickness of the component during use. The principal difference between this particular embodiment and the embodiment as illustated in FIGURES 1 and 4, is the fact that in this particular embodiment would be used on a tibial component which would not include the ramp post 43. Therefore, the centrally located process which provides posterior stabilization of the femoral component relative to the tibial component would not be utilized. Again, this embodiment would be used in a knee replacement which does not foresee the need to provide posterior stabilization between the femoral and the tibial components.

The embodiment in FIGURE 6 is for the most part, identical to the principal embodiment as seen in the Figures, except for the fact that the embodiment in FIGURE 6 would include an adaptor 104 positioned at the point where post 80 is positioned in the preferred embodiment, adaptor 104 including a truncated body member 105, cylindrical in shape, for accommodating a removable post 80A which would, for the most part, be frictionally engaged upon member 105 during use. Therefore, this particular embodiment rather that have a post affixedly attached to the base of platform 40, would have the adaptability to receive various lengths and diameter of post depending on the need required for that particular insert. Structurally, however, it would resemble the principal embodiment in FIGURE 1.

As was stated earlier, each of the embodiments, whether it be the preferred embodiment, or the embodiments illustrated in FIGURES 4 through 6 would all have the ability to receive the various inserts 70, 71, or 72 in order to build up the thickness of the femoral component once it is placed in position. In addition, although it is illustrated in the Figures that the inserts 70 are generally rectangular in nature, it is foreseen that the inserts could be of various thicknesses and sizes, so as to accommodate any particular loss of bone which would have to be replaced with the use of an insert during surgery.

In addition, although it is illustrated that the modular knee portion contain the platform 40 which may be attached to the inner surfaces of femoral component 12, it is possible that for purposes of construction platform 40 may be integral with femoral portion 12, and yet may however receive additional plate members 70, 71 or 72 in achieving greater thickness of the femoral component during implantation. Overall, it is foreseen that the modular nature of this invention would allow practically an unlimited application of construction members included in the basis construction so that a surgeon, when confronted with a problem of reconstruction during surgery, can solve that problem quite easily by substitution of lost bone with a modular plate member.

Claims

1. A modular knee prosthesis (10), comprising:
   a) a tibial component (13), comprising a platform portion (17); and
   b) a femoral component (12), comprising a pair of condylar portions (14,16), each of the condylar portions including an external surface (20) for registering with the tibial component to allow traveling movement of the components in relation to one another for simulating the movement of a natural knee;
   characterized in that the platform portion (17) has a pair of oblong concavities (39,41), that the external surface (20) of each of the condylar portions is arranged to register

with a respective concavity (39,41) and that the prosthesis further comprises:
c) platform means (40,70,71,72) adapted for mounting on the femoral component (12) and, in use, to register with the lower end of the femur, said platform means comprising at least one of a plurality of interchangeable means (70,71,72) of different thicknesses selectable to adjust the thickness of the platform means (40,70).

2. A prosthesis as claimed in Claim 1, including movement limit means (43,60,61,62,64) mounted with the tibial component (13) and the femoral component (12) to influence rotation of the knee in both directions of rotation.

3. A prosthesis as claimed in Claim 2, wherein the movement limit means (43,60,61,62,64) includes means to limit relative transverse rotation of the tibial and femoral components with respect to each other.

4. A prosthesis as claimed in any of the preceding claims, wherein the femoral component (12) includes a pair of femoral condyles (14,16) with a intercondylar space (26) therebetween.

5. A prosthesis as claimed in Claim 1, wherein the tibial component has a movement limiting post (43) and the platform means (40) further includes a tibial post traveling recess (61)defined by a pair of vertical walls (60,62), said walls sloping anteriorally into the base of the platform means from a superior point posterior of the platform means, the walls being intersected by a transverse stabilizer post (64).

6. A prosthesis as claimed in Claim 4, wherein a stabilizer post (64) cams against a camming face (91) of a movement limiting post (43) of the tibial component during flexion of the knee to prevent movement of the femoral component out of registration with the tibial component.

7. A prosthesis as claimed in any of the preceding claims, wherein said interchangeable means comprise modular plates (70,71,72) for mounting on the platform means (40) for selectively fitting the femoral component (12) to the femoral condyle.

8. A prosthesis as claimed in any of the preceding claims, further comprising a post member (80) positionable on the platform means (40) to assist in securing the femoral component to the femur.

9. A prosthesis as claimed in Claim 1 wherein the femoral component (12) comprises:
i) a base portion (12) including the pair of condylar portions (14,16), spaced apart and slidable in the concavities (39,41) of the tibial component (13);
ii) a removable platform member (45) positionable to register with inner surfaces (32) of the femoral base portion (12); and
iii) means (54,56) for securing the platform member in position intermediate the femoral base portion and the femur it is to be secured to;
said interchangeable means (70,71,72) being selectively positionable on the removable platform member to adjust the thickness of the platform member for receiving the femoral component thereupon.

10. A prosthesis as claimed in Claim 9, wherein said interchangeable means (70,71,72) includes one or more spacers (70) further comprising a plurality of rectangular portions, positionable upon the platform member for defining a thickened femoral portion.

11. A prosthesis as claimed in Claim 10, wherein the spacers (70) are of varying thickness to allow for adjustment of the thickness of the femoral component.

12. A prosthesis as claimed in Claim 10 or 11, wherein the rectangular portions (70) are constructed of metal or other hard substance.

13. A prosthesis as claimed in any of the preceding claims, wherein the external surface (20) of each condylar portion (14,16) is laterally convexly curved along its antero-posterior extent to allow antero-posterior rotation between the femoral component (12) and the tibial component (13).

14. A prosthesis as claimed in Claim 1, wherein the platform means (40) additionally includes adaptor means for the fitting to the platform means of a post member (80) for use in securing the femoral component to a femur.

15. A prosthesis as claimed in Claim 14, wherein the adaptor means is adapted for the fitting of a post member (80) from a range of different sized post members.

Patentansprüche

1. Eine modulare Knieprothese (10) umfassend:
a) eine Schienbeinkomponente (13), die einen Plattformbereich (17) umfaßt; und

b) eine Oberschenkelkomponente (12), die ein Paar von Gelenkknorrenbereichen (14, 16) umfaßt, wobei jeder der Gelenkknorrenbereiche eine äußere Oberfläche (20) zur Passung mit der Schienbeinkomponente einschließt, um eine Hin- und Herbewegung der Komponenten relativ zueinander zur Simullerungder Bewegung eines natürlichen Knies zu erlauben;

dadurch gekennzeichnet, daß der Plattformbereich (17) ein Paar länglicher Rundhöhlungen (39, 41) aufweist, daß die äußere Oberfläche (20) von jedem der Gelenkknorrenbereiche angeordnet ist, an einer jeweiligen Rundhöhlung (39, 41) angepaßt zu sein, und daß die Prothese ferner umfaßt:

c) eine Plattformeinrichtung (40, 70, 71, 72), die an der Oberschenkelkomponente (12) befestigbar ist, und bei Verwendung mit dem unteren Ende des Oberschenkelknochens ausgerichtet ist, wobei die benannte Plattformeinrichtung wenigstens eine einer Vielzahl von austauschbaren Einrichtungen (70, 71, 72) unterschiedlicher Dicke umfaßt, um auswählbar die Dicke der Plattformeinrichtung (40, 70) einzustellen.

2. Eine Prothese, wie in Anspruch 1 beansprucht, die eine Bewegungsbegrenzungseinrichtung (43, 60, 61, 62, 64) einschließt, die an der Schienbeinkomponente (13) und der Oberschenkelkomponente (12) angebracht ist, um die Drehung des Knies in beiden Drehrichtungen zu beeinflussen.

3. Eine Prothese, wie in Anspruch 2 beansprucht, bei der die Bewegungsbegrenzungseinrichtung (43, 60, 61, 62, 64) eine Einrichtung einschließt, um eine relative Querdrehung der Schienbeinkomponente und der Oberschenkelkomponente in bezug aufeinander zu begrenzen.

4. Eine Prothese, wie in irgendeinem der vorhergehenden Ansprüche beansprucht, bei der die Oberschenkelkomponente (12) ein Paar Oberschenkelgelenkknorren (14, 16) mit einem Gelenkknorrenzwischenraum (26) dazwischen einschließt.

5. Eine Prothese, wie in Anspruch 1 beansprucht, bei der die Schienbeinkomponente einen Bewegungsbegrenzungszapfen (43) und die Plattformeinrichtung (40) ferner eine Schienbeinzapfenbewegungsausnehmung (61) einschließt, die von einem Paar vertikaler Wände (60, 62) begrenzt ist, wobei die benannte Wände nach vorne auf die Basis der Plattformeinrichtung von einem oberen Punkt hinter der Plattformeinrichtung abfallen, wobei die Wände von einem querverlaufenden Stabilisierungspfosten (64) geschnitten werden.

6. Eine Prothese, wie in Anspruch 4 beansprucht, bei der ein Stabilisierungspfosten (64) gegen eine Gleitseite (91) eines Bewegungsbegrenzungspfostens (43) der Schienbeinkomponente während des Biegens des Knies gleitet, um eine Bewegung der Oberschenkelkomponente außer Deckung mit der Schienbeinkomponente zu verhindern.

7. Eine Prothese, wie in irgendeinem der vorhergehenden Ansprüche beansprucht, bei der die benannte austauschbare Einrichtung modulare Platten (70, 71, 72) zur Befestigung an der Plattformeinrichtung (40) zur wahlweisen Anpassung der Oberschenkelkomponente (12) an die Oberschenkelgelenkknorren umfaßt.

8. Eine Prothese, wie in irgendeinem der vorhergehenden Ansprüche beansprucht, die ferner ein Zapfenelement (80) umfaßt, das an der Plattformeinrichtung (40) positionierbar ist, um die Befestigung der Oberschenkelkomponente an dem Oberschenkelknochen zu unterstützen.

9. Eine Prothese, wie in Anspruch 1 beansprucht, bei der die Oberschenkelkomponente (12) umfaßt:

i) einen Basisbereich (12), der das Paar von Gelenkknorrenbereichen (14, 16) einschließt, die voneinander beabstandet und in den Rundhöhlungen (39, 41) der Schienbeinkomponente (13) gleitbar sind;

ii) ein entfernbares Plattformelement (45), das zur Deckung mit den inneren Oberflächen (32) des O-berschenkelbasisbereiches (12) positionierbar ist; und

iii) eine Einrichtung (55, 56) zur Befestigung des Plattformelementes in seiner Lage zwischen dem Oberschenkelbasisbereich und dem Oberschenkelknochen, an dem es zu befestigen ist; wobei die benannte austauschbare Einrichtung (70, 71, 72) wahlweise an dem entfernbaren Plattformelement positionierbar ist, um die Dicke des Plattformelementes zur Aufnahme der Oberschenkelkomponente darauf einzustellen.

10. Eine Prothese, wie in Anspruch 9 beansprucht, bei der die benannte austauschbare Einrichtung (70, 71, 72) ein oder mehrerer Abstandsstücke (70) einschließt, und die ferner eine Vielzahl von rechteckförmigen Teilen umfaßt, die auf dem Plattformelement zum Festlegen eines verdickten Oberschenkelbereiches positionierbar sind.

11. Eine Prothese, wie in Anspruch 10 beansprucht, bei der die Abstandsstücke (70) unterschiedliche Dicken aufweisen, um die Einstellung der Dicke der Oberschenkelkomponente zu ermöglichen.

12. Eine Prothese, wie in Anspruch 10 oder 11 beansprucht, bei der die rechteckförmigen Bereiche (70) aus Metall oder einem anderen harten Material hergestellt sind.

13. Eine Prothese, wie in irgendeinem der vorhergehenden Ansprüche beansprucht, bei der die äußere Oberfläche (20) von jedem Gelenkknorrenbereich (14, 17) seitlich längs ihrer Vorder-Rückausdehnung konvex gekrümmt ist, um eine Vorder-Rückdrehung zwischen der Oberschenkelkomponente (12) und der Schienbeinkomponente (13) zu erlauben.

14. Eine Prothese, wie in Anspruch 1 beansprucht, bei der die Plattformeinrichtung (40) zusätzlich eine Anpassungseinrichtung zum Anpassen an die Plattformeinrichtung von einem Zapfenelement (80) zur Verwendung bei der Befestigung der Oberschenkelkomponente an einem Oberschenkelknochen einschließt.

15. Eine Prothese, wie in Anspruch 14 beansprucht, bei der die Anpassungseinrichtung zum Anpassen eines Zapfenelementes (80) aus einer Reihe von Zapfenelementen unterschiedlicher Größe geeignet ist.

Revendications

1. Prothèse modulaire (10) du genou, comprenant :
   a) un élément tibial (13) qui comporte une partie de plate-forme (17), et
   b) un élément fémoral (12) comportant deux parties condyliennes (14, 16) comprenant chacune une surface externe (20) destinée à être positionnée sur l'élément tibial en permettant un mouvement de déplacement des éléments l'un par rapport à l'autre pour la simulation du mouvement d'un genou naturel,
   caractérisée en ce que la partie de plate-forme (17) a deux cavités allongées (39, 41), en ce que la surface externe (20) de chaque partie condylienne est positionnée par rapport à une concavité respective (39, 41), et en ce que la prothèse comporte en outre
   c) un dispositif à plate-forme (40, 70, 71, 72) destiné à être monté sur l'élément fémoral (12) et, pendant l'utilisation, à être positionné sur l'extrémité inférieure du fémur, le dispositif à plate-forme comprenant au moins l'un de plusieurs dispositifs interchangeables (70, 71, 72) ayant des épaisseurs différentes et qui peuvent être choisis pour l'ajustement de l'épaisseur du dispositif à plate-forme (40, 70).

2. Prothèse selon la revendication 1, comprenant un dispositif (43, 60, 61, 62, 64) de limitation de mouvement monté avec l'élément tibial (13) et l'élément fémoral (12) afin qu'il influence la rotation du genou dans les deux sens de rotation.

3. Prothèse selon la revendication 2, dans laquelle le dispositif (43, 60, 61, 62, 64) destiné à limiter le mouvement comporte un dispositif destiné à limiter la rotation relative transversale des éléments tibial et fémoral l'un par rapport à l'autre.

4. Prothèse selon l'une quelconque des revendications précédentes, dans laquelle l'élément fémoral (12) comporte deux condyles fémoraux (14, 16) avec un espace intermédiaire (26).

5. Prothèse selon la revendication 1, dans laquelle l'élément tibial a un montant (43) de limitation de mouvement, et le dispositif à plate-forme (40) comporte en outre une cavité (61) de déplacement de montant tibial, délimitée par deux parois verticales (60, 62), les parois étant inclinées en direction antérieure, vers la base du dispositif à plate-forme et depuis un point supérieur postérieur du dispositif à plate-forme, les parois étant recoupées par un montant stabilisateur transversal (64).

6. Prothèse selon la revendication 4, dans laquelle le montant stabilisateur (64) agit par effet de came contre une face de came (91) d'un montant (43) de limitation de mouvement de l'élément tibial pendant la flexion du genou afin que le mouvement de l'élément fémoral ne puisse pas le chasser de son positionnement par rapport à l'élément tibial.

7. Prothèse selon l'une quelconque des revendications précédentes, dans laquelle les dispositifs interchangeables sont des plaques modulaires (70, 71, 72) destinées à être montées sur le dispositif à plate-forme (40) et permettant le montage sélectif de l'élément fémoral (12) sur le condyle fémoral.

8. Prothèse selon l'une quelconque des revendications précédentes, comprenant en outre un montant (80) destiné à être positionné sur le dispositif à plate-forme (40) afin qu'il facilite la fixation de l'élément fémoral au fémur.

9. Prothèse selon la revendication 1, dans laquelle

l'élément fémoral (12) comporte :

i) une partie de base (12) qui comporte la paire de parties condyliennes (14, 16) qui sont espacées et qui peuvent coulisser dans les cavités (39, 41) de l'élément tibial (13),

ii) un organe amovible à plate-forme (45) destiné à être positionné par rapport aux surfaces internes (32) de la partie de base fémorale (12), et

iii) un dispositif (54, 56) de fixation de l'organe à plate-forme en position entre la partie de base fémorale et le fémur auquel il doit être fixé,

les dispositifs interchangeables (70, 71, 72) pouvant être positionnés sélectivement sur l'organe à plate-forme amovible pour l'ajustement de l'épaisseur de l'organe à plate-forme afin que l'élément fémoral placé soit logé au-dessus.

10. Prothèse selon la revendication 9, dans laquelle les dispositifs interchangeables (70, 71, 72) comportent une ou plusieurs entretoises (70) qui comportent en outre plusieurs parties rectangulaires destinées à être positionnées sur l'organe à plate-forme pour la délimitation de la partie fémorale épaissie.

11. Prothèse selon la revendication 10, dans laquelle les entretoises (70) ont une épaisseur variable permettant l'ajustement de l'épaisseur de l'élément fémoral.

12. Prothèse selon la revendication 10 ou 11, dans laquelle les parties rectangulaires (70) ont une construction formée de métal ou d'une autre substance dure.

13. Prothèse selon l'une quelconque des revendications précédentes, dans laquelle la surface externe (20) de chaque partie condylienne (14, 16) a une courbure latéralement convexe le long de son étendue antéro-postérieure, permettant la rotation antéro-postérieure entre l'élément fémoral (12) et l'élément tibial (13).

14. Prothèse selon la revendication 1, dans laquelle le dispositif à plate-forme (40) comporte en outre un dispositif adaptateur destiné à s'ajuster sur le dispositif à plate-forme d'un montant (80) destiné à être utilisé pour la fixation de l'élément fémoral à un fémur.

15. Prothèse selon la revendication 14, dans laquelle le dispositif adaptateur est destiné à assurer le montage d'un montant (80) de toute une gamme de montants de dimensions différentes.

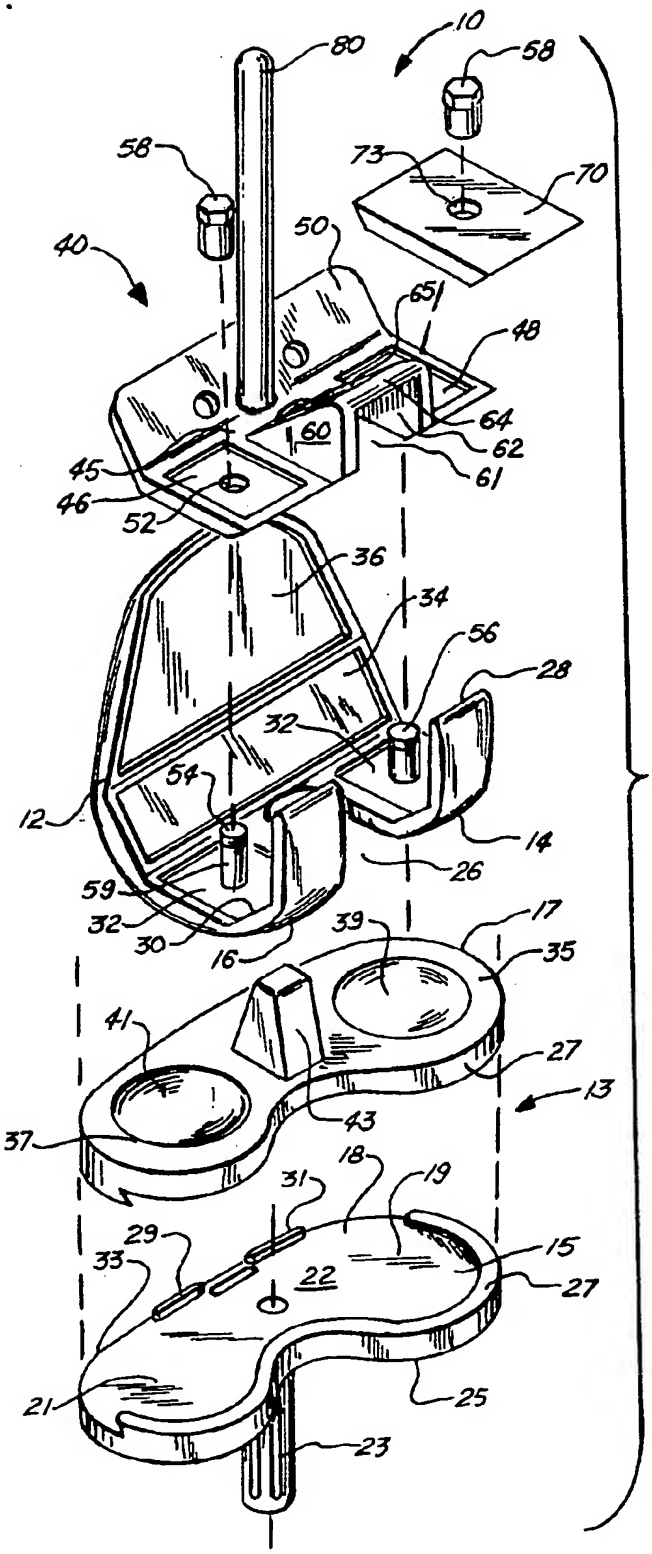

FIG. 1.

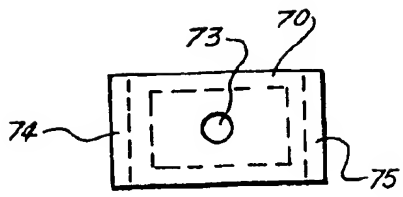

FIG. 2.

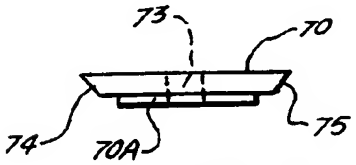

FIG. 3.

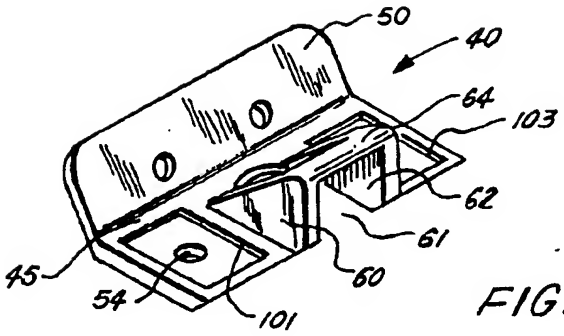

FIG. 4.

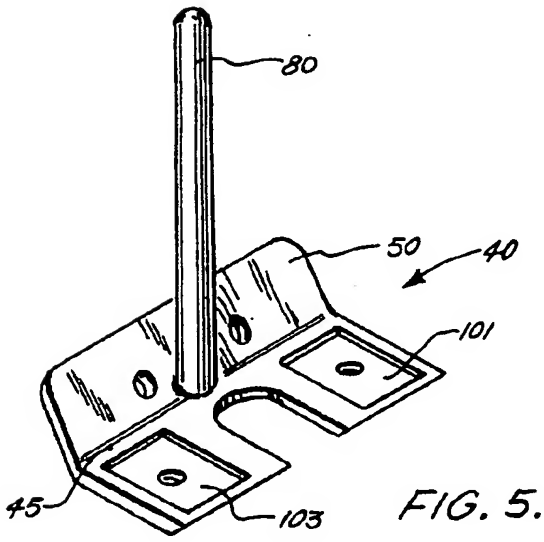

FIG. 5.

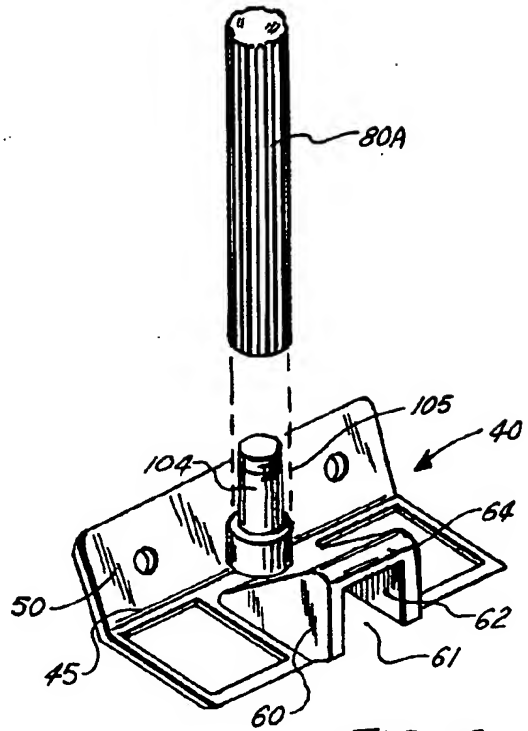

FIG. 6.

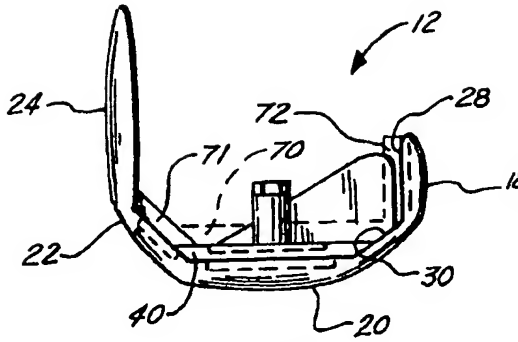

FIG. 7.

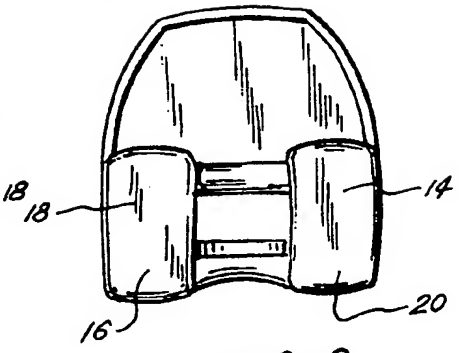

FIG. 8.

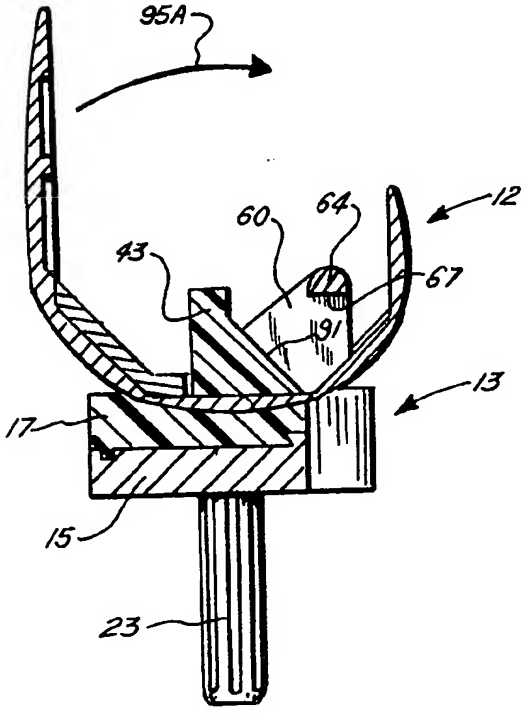

FIG. 9.

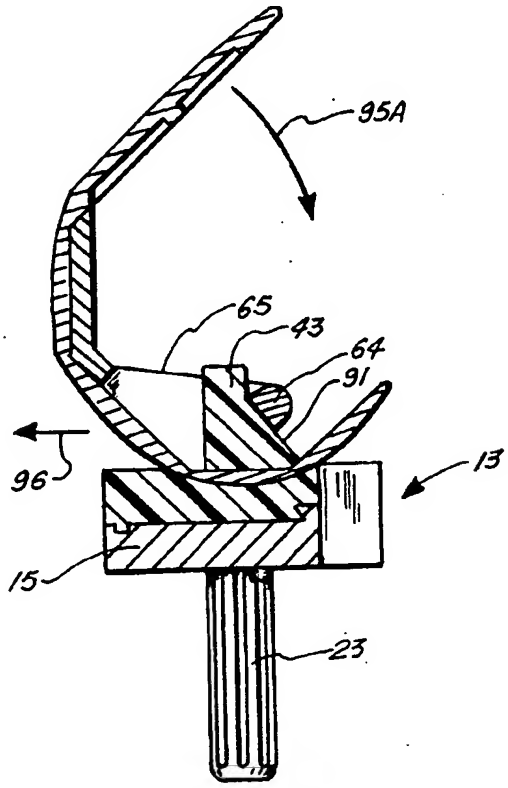

FIG. 10.